Sonographic Evaluation of Clubfoot

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***Abstract**:Congenital clubfoot is a common foot deformity reported with a prevalence of 4-7/ 1000 in various populations world over. It has four component deformities in seven possible combinations. Although, the assessment is done clinically by palpation but this clinical grading of the deformity is fraught with interobserver variability and inaccuracy due to thickened soft tissues. As the treatment most widely used these days is conservative comprising of serial manipulation and casting, there is a need of a reliable imaging modality for interval follow –up. Radiography has traditionally been used for the same but fell out of favour due to risks posed by radiation in children. Sonography can fulfil this role very well being a radiation free widely available imaging tool. Various authors have tried to describe the pathoanatomy of clubfoot on sonography using different views and parameters. However, a standard imaging technique is lacking. None of the studies so far have tried to compare clinical, radiographic and sonographic findings. We undertook this study to describe a comprehensive sonographic technique for examination of clubfoot. Further we compared the clinical grade of clubfoot severity (using Dimeglio system) with relevant radiographic and sonographic parameters to derive the meaningful correlations. These might serve as the basis for a sonographic grading system of clubfoot severity.*
***Keywords:** Clubfoot; CTEV; Sonography; Radiography; Correlation*

INTRODUCTION

Congenital clubfoot or CTEV (congenital talipes equinovarus) is a common congenital foot deformity, reported with an incidence of 4 – 7 / 1000 in different populations[1]. The incidence in Indian population has been reported around 1.51/1000 population[2]. Four basic deformities have been described: hindfoot equinus, hindfoot varus, forefoot adduction and talo-navicular subluxation in seven possible combinations.

The treatment of clubfoot was conservative manipulation and casting to begin with. It showed a transition to aggressive operative correction in early 19th century and reverted back to serial manipulation and casting followed by surgical correction only in resistant cases due to high success rates proposed by Ponseti[3]. There was found to be a greater reducibility to normal anatomy when the treatment is begun early[4] . Hence, need to detect and quantify the deformities in early neonatal period.

Clinical classification of clubfoot is limited by interobserver variability and difficulties encountered in palpating infant foot for accurate quantification of degree of deformities. Initially, radiography was proposed as a technique to assist in the evaluation and treatment of clubfeet by Barwell in 1896[5]. It took some time to standardize the radiographic technique. This was done by Simons GW in 1977[5] and is still being followed routinely.

Only few studies are available describing the gross morphology and the interosseous relationships of individual bones of the neonatal clubfoot on CT[6] and MRI[7,8]. CT has the disadvantage of radiation exposure and poorer soft tissue resolution as compared to MRI. MRI has good soft tissue resolution but requires sedation of the child, is more time - consuming and difficult to interpret. This is compounded by the lack of familiarity with these images among the orthopaedic surgeons and the high cost involved.

Sonography offers an alternative dynamic imaging modality for clubfoot assessment. It offers a good assessment of the unossified cartilaginous tarsal bones and the surrounding soft tissues. Dynamic sonography offers the advantage of assessing the rigidity of various compartments of the clubfoot and their correctability on manipulation. It is easy to perform, takes less time and does not require sedation. Being radiation free, it can be repeated for monitoring the response to treatment. This will help pickup any spurious correction or non-responding foot which, may benefit from early operative treatment. Various authors have described the sonographic anatomy of the normal neonatal foot and clubfoot employing different scan planes and have devised some sonographic measurements [1,9-13]. Aurell Y et al[9] found acceptable intra- and inter-observer assessments for medial malleolar-navicular (MMN) distance, soft tissue thickness, navicular displacement and "talar head pointing laterally", but questionable for the calcaneo-cuboid (C-C) distance and medial deviation of the talar neck.

However, there is lack of a standardized technique for the sonographic examination of the neonatal clubfoot. To the best of our knowledge, there is no published study which compares the clinical, radiographic and sonographic findings in clubfoot. Hence, this study was undertaken to correlate the sonographic finding with clinical and radiographic findings in clubfoot.

MATERIALS AND METHODS

A prospective case – control study was conducted on 31 babies with unilateral CTEV referred from orthopaedics OPD. The unaffected foot was taken as control in all cases.

Patients of 0 -1 year age group and of either gender having strictly unilateral idiopathic CTEV on clinical examination were included. Only untreated cases (virgin cases) of CTEV were included.

The following were excluded from the study:

- All the patients whose caretakers refused consent
- Patients who had undergone any prior treatment for CTEV (either cast or surgical)
- All patients who had associated neurological disorders like cerebral palsy, myelomeningocoele, arthrogryposis multiplex congenita or other associated lower limb disorders
- Patients with only forefoot deformity i.e. metatarsus adductus

The study was carried out in the department of Radiology and Imaging along the following lines:

- A written and informed consent was taken
- Detailed history, general physical and local examination were recorded

Relevant clinical measurements were taken on both feet and grading of severity done according to Diméglio system of classification[4].

Analytical Radiography

Both AP and lateral radiographs of normal and affected feet were taken and angular measurements made on the anteroposterior and lateral radiographs as per given by GW Simons[5] and recorded (Fig. 1, 2).

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